REMARKS

Claims 1-14 and 18 have been rejected by the Examiner. Such rejections are fully traversed below. Claim 1 has been amended. Claims 19-21 have been added.

Claims 1-14, and 18-21 are thus pending in this Application.

Rejections Under 35 U.S.C. § 112, second paragraph

Claim 8 was rejected to under 35 U.S.C. 112, second paragraph, as being indefinite and for failing to particularly point out and distinctly claim the invention.

Applicants respectfully submit that one of skill in the art is aware of process chemistry used in a semiconductor fabrication apparatus and note that it is not necessary for claim 8 to recite specific details that would be apparent to one of skill in the art, particularly when process chemistry usage for a semiconductor fabrication apparatus is a well known practice. The Examiner states the scope of claim 8 would change when the process gas chemistry was changed. Applicants respectfully disagree. The scope of claim 8 is independent of the process chemistry used in the semiconductor fabrication apparatus and is not limited by any particular chemistry. Thus, Applicants respectfully submit that claim 8 is not vague and indefinite to one of skill in the art and that amendments to resolve any indefiniteness are not necessary.

Accordingly, Applicants respectfully submit that all pending claims are sufficiently clear and definite and thus respectfully request withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Rejections Under 35 U.S.C. § 102(b)103(a)

Claims 1-14 and 18 stand rejected under 35 U.S.C. §102(b) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Maydan et al., U.S. Patent No. 5,746,875 ("Maydan"). Applicants respectfully traverse.

Claims 1-14 and 18 stand rejected under 35 U.S.C. §103(a), as obvious, over Maydan et al., U.S. Patent No. 5,746,875 ("Maydan") in view of Gupta, U.S. Patent No. 6,083,451. Applicants respectfully traverse.

Claims 1-6, and 8 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Shang et al., U.S. Patent No. 6,182,603 B1 ("Shang"). Applicants respectfully traverse.

Claims 1-14 and 18 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Wicker I et al., U.S. Patent No. 5,993,584 ("Wicker I"). Applicants respectfully traverse.

Claims 1-14 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Wicker I et al., U.S. Patent No. 5,993,584 ("Wicker I") or Wicker II, U.S. Patent No. 5,863,376 taken in view of Maydan, U.S. Patent No. 5,746,875, Chen, U.S. Patent No. 5,824,605, and optionally in further view of the applicants' description of the prior art. Applicants respectfully traverse.

Independent claim 1 has been amended to recite that the plurality of holes are a plurality of drilled holes. This is supported by page 5, line 1, of the application.

The Examiner had indicated that claims 1-14 and 18 were rejected under 35 U.S.C. §102(b) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Maydan et al. Applicants respectfully disagree. Maydan teaches formation of defect free smooth surfaces by external polishing procedures. As Maydan notes, the surfaces are defect free because the constituent elements are manufactured and machined as separate pieces prior to the assembly of the gas distribution apparatus. (Col. 5, lines 62-65). Maydan doesn't teach a particular dimension of defect which is eliminated by either machining or polishing. Moreover, Maydan teaches nothing about eliminating defects by heat treatment. The Examiner stated that the results of external polishing are either identical or only slightly different than removing defects by heating. The Examiner did not cite anything showing that external polishing provides the same results as heating. One difference is that external polishing is not able to polish inside drilled holes. In addition, claim 1 has been amended to recite that the plurality of holes are drilled. Maydan does not provide drilled holes for passing process gas. Col. 5, line 57, to col. 6, line 5, of Maydan explains that the slotted apertures or nozzles 60 is provided by closely placed block elements 42, 44, 46, and 50 which may be machined as separate pieces and externally polished prior to assembly. Such polishing is not accomplished in drilled

holes, which are not externally polished. Thus, Maydan neither teaches nor suggests the elements of claim 1 or claim 12.

The Examiner had indicated that claims 1-14 and 18 were rejected under 35 U.S.C. §103(a), as being obvious, over Maydan et al., U.S. Patent No. 5,746,875 ("Maydan") in view of Gupta, U.S. Patent No. 6,083,451. Applicants respectfully disagrees. Regarding the above mentioned shortcomings of Maydan, Gupta does not teach a particular dimension of defect which is eliminated by heat treatment or recite a plurality of drilled holes. In addition, the Examiner failed to specifically point out anything in Gupta that teaches heat treatment of machined surfaces. For at least these reasons, claim 1-14 and 18 are not made obvious by Maydan in view of Gupta.

The Examiner had indicated that claims 1-6 and 8 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Shang et al. Applicants respectfully disagree. Shang teaches using a surface treated shower head for improved cleaning of a plasma chamber and which is purported to absorb fewer fluorine radicals during the cleaning process (Col. 3, lines 45-55). Specifically, Shang teaches the formation of an aluminum fluoride or other fluoride based protective layer provided on the outer surface of the showerhead (Col. 6, lines 45-60). In order to form the fluorine based protective compound, the process temperatures as taught by Shang include exposing the showerhead to a fluorine gas at a temperature of about 350 C. (Col. 6, lines 51-59). There is no teaching or suggestion that a portion of the showerhead is formed having substantially no micro-defects about 50 micrometers or greater, as recited in claims 1 and 12. As noted in Col. 7, lines 16-20, the combination of the non-anodized shower head, electro-polishing, as well as the fluoride based protective layer, can reduce the amount of contamination which may occur during the deposition of thin films onto the substrate. Shang teaches that this results from fewer fluorine radicals absorbed during the cleaning and thus teaches nothing about contamination where fluorine is not used in the process. Further, the fluorine protective layer process temperatures of 350 C do not teach or suggest the heat treating temperatures of 1500 to 1600 C as in claim 12.

Moreover, heating the showerhead to form a fluorine based protective layer as taught by Shang is limited to a showerhead comprising bare aluminum. Thus, Shang

makes no teaching remotely related to the gas distribution plate of claims 9 wherein the gas distribution plate includes a ceramic material.

The Examiner had also indicated claims 1-14 and 18 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Wicker I et al. Wicker I et al. does not disclose a machined surface exposed to the process chemistry with substantially no micro-defects. Wicker I forms the GDP by hot pressing silicon nitride at a temperature above 1500° C. If no machining of the GDP occurs after formation, then such a GDP would not have a machined surface. If machining is done after formation, as taught on page 6, lines 5-9, of the application, such machining causes micro-defects on the machined surface. Wicker I does not disclose a process for removing micro-defects on the machined surface. For at least these reasons, claims 1-14 and 18 are not anticipated by or made obvious by Wicker I.

The Examiner had also indicated that claims 1-14 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wicker I, Chen, or Wicker II taken in view of Maydan and /or applicant's description of the prior art. Applicants respectfully disagree. Although the Examiner stated that Chen discloses a GDP formed by heat treating and that the GDP can be shaped by machining prior to the heat treating step, the Examiner did not indicate where in Chen it is disclosed or suggested that such machined surface has substantially no micro-defects about 50 micrometers or greater, as recited in claims 1 and 12. In addition, none of the above cited prior art references teach or suggest a gas distribution plate having a portion with a machined surface being subjected to heat treating, as recited in claims 3 and 12. Applicants respectfully disagree that any seasoning during wafer processing teaches the pretreating at a controlled temperature. Moreover, none of the suggestions regarding seasoning in the prior art taught or suggested the temperatures identified in claim 12, i.e. pretreated by heating at a controlled temperature between about 1500 degrees Celsius to 1600 degrees Celsius for a prolonged time. In addition, Maydan teaches away from drilled holes. Instead Maydan teaches pieces that are individually externally polished before assembly. The drill holes could not be externally polished.

Dependent claims 2-11, and 13-14, and 18 each depend either directly or indirectly from independent claims 1 and 12 and, therefore, are respectfully submitted

to be patentable over Maydan, Shang, Wicker I, Wicker II, and Chen or any combination thereof, for at least the same reasons set forth above with respect to the independent claims.

Further, the dependent claims require additional elements that when considered in context of the claimed inventions further patentably distinguish the inventions from the art of record.

By way of example, dependent claim 8 recites "wherein the gas distribution plate includes a material whose products from reacting with the process chemistry used in the semiconductor fabrication apparatus are gaseous". Applicants respectfully submit that the art of record does not teach this limitation. Withdrawal of the rejections of claims 1-14 and 18-19 based on 35 U.S.C. § 102(b), 102(e) and 103(a) are therefore respectfully requested.

Claim 19 has been added to be dependent on claim 12 and further recite that the holes are drilled holes, where pretreating by heating is done after formation of the plurality of drilled holes. This is supported by FIG. 3 of the application.

Claim 20 has been added to be dependent on claim 19 and further recite that the heating eliminates micro-defects on the surfaces of the plurality of drilled holes.

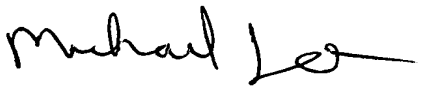
Claim 21 has been added to be dependent on claim 1 and further recite that micro-defects on surfaces of the plurality of drilled holes are substantially eliminated by heating the portion.

In view of the foregoing, Applicants believe that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

No fees are believed due in connection with the filing of this paper. However,

if any fees are due in connection with the filing of this paper the Commissioner is authorized to charge such fees to Deposit Account 50-0388 (Order No. LAM1P118).

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP



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CLEAN VERSION OF PENDING CLAIMS

1. (Four Times Amended) A gas distribution plate for use in a semiconductor fabrication apparatus including a semiconductor processing chamber, the gas distribution plate comprising:

a plurality of drilled holes for passing process gases to the semiconductor processing chamber; and

a portion having a machined surface exposed to the process chemistry used in the semiconductor fabrication apparatus, wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater.

2. (Three times Amended) A gas distribution plate as recited in claim 1 wherein micro-defects within the plurality of drilled holes are substantially eliminated before implementation within the semiconductor fabrication apparatus.

3. (Once Amended) A gas distribution plate as recited in claim 1 wherein the micro-defects are substantially eliminated by heating the portion.

4. A gas distribution plate as recited in claim 1 wherein the portion includes at least one surface of the distribution plate which is exposed to the internal regions of the semiconductor processing chamber.

5. (Twice Amended) A gas distribution plate as recited in claim 1 wherein, during its operation, the gas distribution plate produces less than 0.1 particle defects per square centimeter for a wafer processed in the semiconductor fabrication apparatus over the entire operating life of the gas distribution plate.

6. A gas distribution plate as recited in claim 1 wherein the gas distribution plate does not substantially diminish wafer yield over the entire operating life of the gas distribution plate.

7. (Once Amended) A gas distribution plate as recited in claim 6 further comprising at least one distribution channel, wherein the at least one distribution channel is machined to a back face of the gas distribution plate.

8. (Once Amended) The gas distribution plate as recited in claim 1 wherein the gas distribution plate includes a material whose products from reacting with the process chemistry used in the semiconductor fabrication apparatus are gaseous.

9. The gas distribution plate as recited in claim 1 wherein the gas distribution plate includes a ceramic material.

10. A gas distribution plate as recited in claim 9 wherein the plate includes one of Si_3N_4, Al_2O_3 , AlN and SiC.

11. A gas distribution plate as recited in claim 9 wherein the ceramic material is included in a portion of the gas distribution plate which faces the semiconductor processing chamber.

12. (Twice Amended) A plasma-based fabrication apparatus, comprising:

a plasma chamber that receives process gases and forms a plasma therefrom; and

a gas distribution plate including a plurality of holes that supply the process gases into said plasma chamber, a portion of said gas distribution plate having a machined surface and being exposed to the process chemistry used in said plasma chamber, wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater and wherein said gas distribution plate is pretreated by heating at a controlled temperature between about 1500 degrees Celsius to 1600 degrees Celsius for a prolonged time.

13. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein said plasma-based fabrication apparatus fabricates semiconductor devices.

14. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein said plasma-based fabrication apparatus is a semiconductor etch machine.

18. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein the prolonged time is from about 5 to 10 hours.

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40 ~~19~~. (New) A plasma-based fabrication apparatus, as recited in claim 12, wherein the plurality of holes are a plurality of drilled holes, wherein the pretreating by heating is done after formation of the plurality of drilled holes.

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41 ~~20~~. (New) The plasma based fabrication apparatus, as recited in claim 19, wherein the pretreating by heating eliminates micro-defects on surfaces of the plurality of drilled holes.

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21. (New) A gas distribution plate as recited in claim 1 wherein micro-defects on surfaces of the plurality of drilled holes are substantially eliminated by heating the portion.

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